

Application No.: 10/826,016

Docket No.: IIW-036

REMARKS

The forgoing amendment amends claims 1-2, 4-7 and 15-19. Now pending in the application are claims 1-19, of which claims 1, 3, 9, 13 and 15 are independent.

I. Claim Amendments

Applicants amend claims 1-2, 4-7 and 15-19 to clarify the scope of the claims.

For example, claims 1-2 are amended to provide proper antecedent basis for "the gas." Claims 4, 7-8 and 16 are rewritten in a means-plus-function format to overcome the indefiniteness rejections raised in the Office Action. Claims 6 and 15 are amended to address typographical errors.

Support for the claim amendments can be found in the figures and corresponding descriptions in the specification of the present application. No new matter is added.

II. Summary of Rejections

Claims 1-2, 4-7 and 16-19 are rejected under 35 U.S.C. §112, second paragraph as being indefinite.

Claims 1-2 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent Application Publication No. 2001/0019789 ("Hirakata") in view of U.S. Patent Application Publication No. 2002/0189873 ("Mizuno").

Claim 2 is rejected under 35 U.S.C. §103(a) as being unpatentable over Hirakata in view of Mizuno and further in view of U.S. Patent Application Publication No. 2003/0224226 ("Jia").

Claims 3-12 and 15-19 are rejected under 35 U.S.C. §103(a) as being unpatentable over Hirakata in view of Mizuno.

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Claim 13-14 are rejected under 35 U.S.C. §103(a) as being unpatentable over Hirakata in view of Mizuno and further in view of Jia.

The rejections will be discussed separately below.

III. Claim Rejections under 35 U.S.C. §112

Claims 1-2 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite. (See the Office Action, page 2).

Applicants amend claims 1-2 to clarify that the gas is a fuel gas. Applicants also amend claim 6 to correct the typographical error. (See the Office Action, page 2, paragraph 4). As such, Applicants request withdrawal of the rejections of claims 1-2.

Claims 4-7 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite. (See the Office Action, page 2).

Applicants amend claims 4-7 to recite a means element and hence to remove method steps. As such, Applicants request withdrawal of the rejections of claims 4-7.

Claims 16-19 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite. (See the Office Action, page 3).

Applicants amend claims 16-19 to recite a means element and hence to remove method steps. As such, Applicants request withdrawal of the rejections of claims 16-19.

IV. Rejections of Claims 1-2 under 35 U.S.C. §103

Claims 1-2 are rejected under 35 USC 103(a) as being unpatentable over U.S. Patent Application Publication No. 2001/0019789 ("Hirakata") in view of U.S. Patent Application Publication No. 2002/0189873 ("Mizuno"). (See the Office Action, page 4). Applicants respectfully traverse the rejection.

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Claims 1-2 are directed to a method for cooling a fuel cell that generates power using air and a fuel gas. A cooling liquid is circulated between the fuel cell and a heat exchanger. The fuel gas is separated from the cooling liquid and mixed with the air supplied to or exhausted from the fuel cell. The mixed gas is then exhausted. Claim 2 depends from claim 1 and adds separate and patentable features.

Applicants submit that Hirakata and Mizuno do not teach "separating the fuel gas from the cooling liquid, mixing the separated gas with the air supplied to or exhausted from said fuel cell, and then exhausting the gas," as recited in claim 1.

The Hirakata reference teaches a heat exchange system including a fuel cell (30), a radiator (10), and a gas detector (50). The cooling water circulates between the radiator (10) and the fuel cell (30) such that the cooling water can exchange heat with the radiator (10) and the fuel cell (30). The hydrogen sensors (50, 52, 54) are disposed at the radiator (10) or the cooling water passage to detect the hydrogen gas that leaks into the cooling water.

The Hirakata reference teaches that the hydrogen gas leaking into the cooling water is collected in the upper tank (12) or the reserve tank (24) where the gas detectors are mounted. If the hydrogen sensors detect the hydrogen collected in the upper tank (12) or the reserve tank (24), the hydrogen leakage warning lamp (92) informs the driver of the leakage. The Hirakata reference, however, does not teach that the collected hydrogen is mixed with the air supplied to or exhausted from the fuel cell, as required in claim 1.

The Examiner recognizes in the Office Action that "Hirakata et al. does not specifically teach using air supplied to or exhausted from the fuel cell." (See the Office Action, page 6, lines 1-2). The Examiner, however, alleges that the hydrogen dilution taught in the Mizuno reference compensates for the deficiencies of the Hirakata reference. (See the Office Action, page 6, lines 2-15). Applicants respectfully disagree.

The Mizuno reference teaches a hydrogen dilutor (424) that receives the hydrogen gas discharged from the fuel cell. The Mizuno reference also teaches that the hydrogen dilutor (424)

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receives the oxygen off-gas discharged from the fuel cell. The hydrogen dilutor (424) dilutes the discharged hydrogen gas by mixing the hydrogen gas and the oxygen off-gas. The diluted hydrogen gas is introduced into the oxygen off-gas discharging channel (503) and is further mixed with the oxygen off-gas flowing in the oxygen off-gas discharging channel (503).

The Mizuno reference teaches a hydrogen dilutor (424) that receives the hydrogen gas discharged from the fuel cell. The Mizuno reference also teaches that the hydrogen dilutor (424) receives the oxygen off-gas discharged from the fuel cell. The hydrogen dilutor (424) dilutes the discharged hydrogen gas by mixing the hydrogen gas and the oxygen off-gas. The diluted hydrogen gas is introduced into the oxygen off-gas discharging channel (503) and is further mixed with the oxygen off-gas flowing in the oxygen off-gas discharging channel (503).

The hydrogen dilutor (424) of the Mizuno reference mixes the hydrogen gas discharged from a fuel cell with the oxygen off-gas that is also discharged from the fuel cell. The Mizuno reference, however, does not teach that the hydrogen gas separated from the cooling water is mixed with the air supplied to or exhausted from the fuel cell.

Furthermore, Applicants submit that Hirakata and Mizuno do not teach "the gas mixed with air supplied to the fuel cell is introduced into a cathode of the fuel cell," as recited in claim 2.

In Mizuno, the diluted hydrogen gas is introduced into the oxygen off-gas discharging channel (503) and is further mixed with the oxygen off-gas flowing in the oxygen off-gas discharging channel (503). Mizuno, however, does not teach that "the gas mixed with air supplied to the fuel cell is introduced into a cathode of the fuel cell," as recited in claim 2.

As such, Applicants submit that Hirakata and Mizuno fail to teach all of the limitations of claims 1-2. Applicants therefore request withdrawal of the rejection of claims 1-2.

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V. Rejection of Claim 2 under 35 U.S.C. §103

Claim 2 is rejected under 35 USC 103(a) as being unpatentable over U.S. Patent Application Publication No. 2001/0019789 ("Hirakata") in view of U.S. Patent Application Publication No. 2002/0189873 ("Mizuno") and further in view of U.S. Patent Application Publication No. 2003/0224226 ("Jia"). (See the Office Action, page 6). Applicants respectfully traverse the rejection.

Claim 2 depends from claim 1 and adds the feature that the gas mixed with air supplied to the fuel cell is introduced into a cathode of the fuel cell. The Examiner recognizes that Hirakata and Mizuno do not teach this feature of claim 2. (See the Office Action page 6). The Examiner, however, asserts that the Jia reference compensates for the deficiencies of the Hirakata and Mizuno references. (See the Office Action, page 7). Applicants respectfully disagree.

The Jia reference teaches exposing the cathode to hydrogen for conditioning a fuel cell in an initial operating period. The Examiner refers to paragraph 21 as teaching the feature recited in claim 2. The portion of the Jia reference referenced by the Examiner recites that "controller 18 signals oxidant shutoff valve 15 to close and signals fuel shutoff valve 16 and fuel conditioning valve 17 to open thereby providing hydrogen directly to cathode 4." (See the Jia reference, paragraph 21). The Jia reference, however, does not teach that a *mixed gas* is supplied to the cathode of a fuel cell. Moreover, the Jia reference does not teach that the hydrogen gas separated from the cooling water and then mixed with the air supplied to the fuel cell is provided to the cathode of the fuel cell.

As such, Applicants submit that Hirakata, Mizuno and Jia fail to teach all of the limitations of claim 2. Applicants therefore request withdrawal of the rejection of claim 2.

VI. Claim Rejections under 35 USC §103

Claims 3-12 and 15-19 are rejected under 35 USC 103(a) as being unpatentable over U.S. Patent Application Publication No. 2001/0019789 ("Hirakata") in view of U.S. Patent

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Application Publication No. 2002/0189873 ("Mizuno"). (See the Office Action, page 7).

Applicants respectfully traverse the rejection.

A. Claim 3

Applicants respectfully submit that Hirakata and Mizuno do not teach "said cooling liquid storage container communicates with a supply air pipe, which supplies air into the fuel cell, or with an exhaust pipe, which exhausts the air from the fuel cell, via a signal pressure pipe," as recited in claim 3.

The Examiner recognizes in the Office Action that "Hirakata et al. does not specifically teach using air supplied to or exhausted from the fuel cell." (See the Office Action, page 9, lines 3-4). The Examiner, however, asserts that the hydrogen dilution taught in the Mizuno reference compensates for the deficiencies of the Hirakata reference. (See the Office Action, page 9, lines 3-17). Applicants respectfully disagree.

As discussed above, the hydrogen dilutor (424) of the Mizuno reference mixes the hydrogen gas discharged from a fuel cell with the oxygen off-gas that is also discharged from the fuel cell. The Mizuno reference, however, does not teach that the cooling liquid storage container communicates with a supply air pipe, which supplies air into the fuel cell, or with an exhaust pipe, which exhausts the air from the fuel cell, via a signal pressure pipe, as recited in claim 3.

The cited references do not teach the signal pressure pipe recited in claim 3. The signal pressure pipe recited in claim 3 enables the cooling liquid storage container to communicate with the supply air pipe or with the exhaust pipe. The combination of the Hirakata and Mizuno references does not teach any pipe that connects the upper tank (12) or the reserve tank (24) of the Hirakata reference to the supply air pipe or with the exhaust pipe of a fuel cell.

As such, Applicants submit that Hirakata and Mizuno fail to teach all of the limitations of claim 3. Applicants therefore request withdrawal of the rejection of claim 3.

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B. Claims 4-8

Claims 4-8 depend from claim 3 and, as such, incorporate the patentable features of claim 3. Applicants therefore request withdrawal of the rejection of claims 4-8.

C. Claim 9

Applicants submit that Hirakata and Mizuno do not teach "a gas phase portion that communicates with a supply air pipe, which supplies air into said fuel cell via a flow-in pipe, and which mixes the gas separated from the cooling liquid within said liquid phase portion with the air flowing therein through said flow-in pipe from said supply air pipe," as recited in claim 9.

The Examiner recognizes in the Office Action that "Hirakata et al. does not specifically teach using air supplied to or exhausted from the fuel cell." (See the Office Action, page 9, lines 3-4). The Examiner, however, asserts that the hydrogen dilution taught in the Mizuno reference compensates for the deficiencies of the Hirakata reference. (See the Office Action, page 9, lines 3-17). Applicants respectfully disagree.

As discussed above, the hydrogen dilutor (424) of the Mizuno reference mixes the hydrogen gas discharged from a fuel cell with the oxygen off-gas that is also discharged from the fuel cell. The Mizuno reference, however, does not teach that a gas phase portion communicates with a supply air pipe, which supplies air into the fuel cell via a flow-in pipe, and which mixes the gas separated from the cooling liquid within the liquid phase portion with the air flowing therein through the flow-in pipe from said supply air pipe, as recited in claim 9.

The cited references do not teach the flow-in pipe recited in claim 9. The flow-in pipe recited in claim 9 enables the gas phase portion of the cooling liquid storage container to communicate with *the supply air pipe*. The combination of the Hirakata and Mizuno references, however, does not teach any pipe that connects the upper tank (12) or the reserve tank (24) of the Hirakata reference to the supply air pipe of a fuel cell.

As such, Applicants submit that Hirakata and Mizuno fail to teach all of the limitations of claim 9. Applicants therefore request withdrawal of the rejection of claim 9.

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D. Claims 10-12

Claims 10-12 depend from claim 9 and, as such, incorporate the patentable features of claim 9. Applicants therefore request withdrawal of the rejection of claims 10-12.

E. Claim 15

Applicants submit that Hirakata and Mizuno do not teach "a gas exhaust mechanism, which communicates with said air pipe via a ventilation pipe, and which exhausts the fuel gas in said cooling liquid storage container out of the system by a ventilation current flowing within said ventilation pipe," as recited in claim 15.

The Examiner recognizes in the Office Action that "Hirakata et al. does not specifically teach using air supplied to or exhausted from the fuel cell." (See the Office Action, page 9, lines 3-4). The Examiner, however, asserts that the hydrogen dilution taught in the Mizuno reference compensates for the deficiencies of the Hirakata reference. (See the Office Action, page 6, lines 2-15, page 9, lines 3-17 and page 13, lines 2-15).

As discussed above, the hydrogen dilutor (424) of the Mizuno reference mixes the hydrogen gas discharged from a fuel cell with the oxygen off-gas that is also discharged from the fuel cell. The Mizuno reference, however, does not teach that a gas exhaust mechanism communicates with the air pipe via a ventilation pipe, and exhausts the fuel gas in the cooling liquid storage container out of the system by a ventilation current flowing within the ventilation pipe, as recited in claim 15.

The cited references do not teach the ventilation pipe recited in claim 15. The ventilation pipe recited in claim 15 enables the cooling liquid storage container to communicate with the supply air pipe or with the exhaust pipe. The combination of the Hirakata and Mizuno references, however, does not teach any pipe that connects the upper tank (12) or the reserve tank (24) of the Hirakata reference to the supply air pipe or with the exhaust pipe of a fuel cell.

As such, Applicants submit that Hirakata and Mizuno fail to teach all of the limitations of claim 15. Applicants therefore request withdrawal of the rejection of claim 15.

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F. Claims 16-19

Claims 16-19 depend from claim 15 and, as such, incorporate the patentable features of claim 15. Applicants therefore request withdrawal of the rejection of claims 16-19.

VII. Rejections of Claims 13-14 under 35 USC §103

Claims 13-14 are rejected under 35 USC 103(a) as being unpatentable over U.S. Patent Application Publication No. 2001/0019789 ("Hirakata") in view of U.S. Patent Application Publication No. 2002/0189873 ("Mizuno") and further in view of U.S. Patent Application Publication No. 2003/0224226 ("Jia"). (See the Office Action, page 11). Applicants respectfully traverse the rejection.

A. Claim 13

Applicants respectfully submit that Hirakata, Mizuno and Jia do not teach "a gas phase portion which communicates with a supply air pipe, which supplies air into said fuel cell via a flow-in pipe and via a flow-out pipe, and which mixes the gas separated from the cooling liquid within said liquid phase portion with the air flowing therein through said flow-in pipe from said supply air pipe, and returns the mixed gas into said supply air pipe via said flow-out pipe," as recited in claim 13.

The Examiner recognizes in the Office Action that "Hirakata et al. does not specifically teach using air supplied to or exhausted from the fuel cell." (See the Office Action, page 13, lines 1-2). The Examiner, however, asserts that the hydrogen dilution taught in the Mizuno reference compensates for the deficiencies of the Hirakata reference. (See the Office Action, page 13, lines 2-15).

As discussed above, the hydrogen dilutor (424) of the Mizuno reference mixes the hydrogen gas discharged from a fuel cell with the oxygen off-gas that is also discharged from the fuel cell. The Mizuno reference, however, does not teach that the hydrogen gas separated from the cooling water is mixed with the air supplied to the fuel cell.

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The Examiner also recognizes that Hirakata and Mizuno do not teach the flow-out pipe recited in claim 13. (See the Office Action page 13, lines 16-20). The Examiner, however, asserts that the Jia reference compensates for the deficiencies of the Hirakata and Mizuno references. (See the Office Action, page 13). The Examiner refers to paragraph 21 as teaching this feature of claim 13. (See the Office Action, page 14). Applicants respectfully disagree.

As discussed above, the portion of the Jia reference referenced by the Examiner recites that "controller 18 signals oxidant shutoff valve 15 to close and signals fuel shutoff valve 16 and fuel conditioning valve 17 to open thereby providing hydrogen directly to cathode 4." (See the Jia reference, paragraph 21). The Jia reference, however, does not teach that *a mixed gas* is returned to the supply air pipe. Moreover, the Jia reference does not teach that the hydrogen gas separated from the cooling water and mixed with the air supplied to the fuel cell is provided to the cathode of the fuel cell.

The cited references do not teach the flow-in pipe and the flow-out pipe recited in claim 13. The flow-in pipe and the flow-out pipe in claim 13 enable the gas phase portion of the cooling liquid storage container to communicate with *the supply air pipe*. The combination of the Hirakata, Mizuno and Jia references does not teach any pipe that connects the upper tank (12) or the reserve tank (24) of the Hirakata reference to the supply air pipe.

Furthermore, Hirakata, Mizuno and Jia do not teach "said flow-in pipe communicating with said supply air pipe at an upstream portion of a humidifier, which is provided on the way to said supply air pipe and which humidifies the air to be supplied to said fuel cell, and said flow-out pipe communicating with said supply air pipe at a downstream of said humidifier," as recited in claim 13. The cited references do not teach the specific structure of the flow-in pipe, the flow-out pipe, the supply air pipe and the humidifier.

As such, Applicants submit that Hirakata, Mizuno and Jia fail to teach all of the limitations of claim 13. Applicants therefore request withdrawal of the rejection of claim 13.

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B. Claim 14

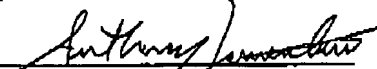
Claim 14 depends from claim 15 and, as such, incorporates the patentable features of claim 13. Applicants therefore request withdrawal of the rejection of claim 14.

VIII. Conclusion

In view of the above amendment, applicant believes the pending application is in condition for allowance.

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Respectfully submitted,

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